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IA1M03029

EXTENDABLE COUPLING STRUCTURE FOR USE IN AN ENGINE

BACKGROUND OF THE INVENTION

1. Field of the invention

The present invention relates to an internal combustion end and, more specifically, to an extendable coupling structure for use in an engine to connect a crankshaft to a piston and to increase the output torque of the engine.

2. Description of the Related Art

In a typical internal combustion engine, of the type found in most vehicles today, a plurality of pistons are respectively movably mounted in a plurality of cylinders formed in an engine block. Each of the pistons has one end connected with a piston rod and the other end coupled to a crankshaft. When spark plugs in the engine block fired to ignite fuel mixture, the pistons are driven downward to turn the crankshaft, which ultimately drives the entire vehicle. At present, in a typical engine, connecting rods are used and connected with the respective first end to the corresponding piston and the respective second end to the corresponding crankshaft. The connecting points between the two ends of each connecting rod and the corresponding piston and corresponding crankshaft are disposed at the ends of the longitudinal center axis of the respective connecting rod. By means of the coupling of the connecting rod between the corresponding piston and the corresponding crankshaft, reciprocating motion of the piston causes the corresponding crankshaft to rotate.

Presently, researchers have reported many studies to enhance the output

torque by extending the moving distance of the connecting rods between the pistons and the crankshafts.

SUMMARY OF THE INVENTION

The present invention has been accomplished under the circumstances in view. It is one object of the present invention to provide an extendable coupling structure for use in an engine to connect a crankshaft to a piston, which greatly enhances the output torque of the engine.

It is another object of the present invention to provide an extendable coupling structure for use in an engine to connect a crankshaft to a piston, which saves fuel consumption of the engine.

It is still another object of the present invention to provide an extendable coupling structure for use in an engine to connect a crankshaft to a piston, which improves the performance of the engine, resulting in reduced amount of solid matter in exhaust gas of the engine.

To achieve these and other objects and according to one aspect of the present invention, the extendable coupling structure is installed in an engine and coupled between a piston and a crankshaft, comprising a first connector pivoted to the piston, a second connector pivoted to the crankshaft, a hinge coupled between the first connector and the second connector, and a spring-based guide coupled between the bottom end of the first connector and the top end of the second connector and adapted to guide movement of the first connector and the second connector between a close position and an open position and to accelerate rotation of the crankshaft. According to another

aspect of the present invention, the spring-based guide comprises a spring guide pin axially movable suspended in a stepped receiving hole in the top end of the second connector, a spring member mounted around the spring guide pin in the stepped receiving hole, the spring member having a top end fixedly fastened to the periphery of the spring guide pin and a bottom end supported on a step inside the stepped receiving hole, and a movable press rod member, the movable press rod member having a top end terminating in a rounded head coupled to a ball socket in the bottom end of the first connector and a bottom end terminating in a flat circular block axially movably fitted into the stepped receiving hole and stopped against the top end of the spring member and the top end of the spring guide pin.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawing is included to provide a further understanding of the invention, and is incorporated in and constitutes a part of this specification. The drawing illustrates an embodiment of the invention and, together with the description, serves to explain the principles of the invention. In the drawing,

FIG. 1 is a sectional plain view of the prior art design.

FIG. 2 is a sectional view showing the detailed structure of an extendable coupling structure according to the present invention.

FIG. 3 is a schematic drawing showing the action of the extendable coupling structure according to the present invention.

FIGS. 4A~4D are schematic drawings showing one moving cycle of

the extendable coupling structure with the piston from the top dead center to the bottom dead center and then from the bottom dead center back to the top dead center according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Reference will now be made in detail to the preferred embodiment of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the description to refer to the same or like parts.

Referring to FIGS. 2 and 3, an extendable coupling structure **1** is shown comprised of a first connector **11**, a second connector **12**, a hinge **13**, a spring member **14**, a spring guide pin **15**, and a movable press rod member **16**.

The first connector **11** has one end, namely, the top end pivoted to a piston **A** by a pivot pin **110**, and the other end, namely, the bottom end terminating in a ball socket **111**.

The second connector **12** has one end, namely, the bottom end pivoted to a crankshaft **B** by a pivot pin **120**, and the other end, namely, the top end provided with an axially extended stepped receiving hole **121**.

The hinge **13** is connected between the periphery of the bottom end of the first connector **11** and the periphery of the top end of the second connector **12**, for enabling the first connector **11** and the second connector **12** to be turned relative to each other.

The spring guide pin **14** is axially movable suspended in the stepped receiving hole **121** in the second connector **12**.

The spring member **15** according to this embodiment is a compression spring mounted around the spring guide pin **14** in the stepped receiving hole **121**, having a top end fixedly fastened to the periphery of the spring guide pin **14** and a bottom end supported on a step **122** inside the stepped receiving hole **121**.

The movable press rod member **16** has a top end terminating in a rounded head **161** coupled to the ball socket **111** of the first connector **11**, and a bottom end terminating in a flat circular block **162** axially movably fitted into the stepped receiving hole **121** and stopped against the top end of the spring member **15** and the spring guide pin **14**.

Referring to FIG. 3 again, because the first connector **11** and the second connector **12** re connected together by the hinge **13**, they can be closed (moved toward each other) and opened (turned outwards from each other). When the first connector **11** and the second connector **12** closed, the movable press rod member **16** is forced downwards to compress the spring member **15**, and the spring guide pin **14** is lowered to touch the inside bottom end of the stepped receiving hole **121**. On the contrary, when the first connector **11** gives no pressure to the movable press rod member **16**, the spring member **15** immediately returns to its former shape, imparting an upward pressure to the spring guide pin **14** and the movable press rod member **16**. Further, because the movable press rod member **16** is coupled between the ball socket **111** of the first connector **11** and the stepped receiving hole **121** of the second connector **12**, it limits the turning angle between the first connector **11** and the second

connector **12** to a limited range.

As an alternate form of the present invention, the spring guide pin **14** may be formed integral with the flat circular block **162** of the movable press rod member **16**.

Referring to FIGS. 4A~4D, when the extendable coupling structure **1** moved with the piston **A** to the top dead center in the combustion engine, the spring member **15** is released. When the piston **A** moving downwards from the top dead center in the combustion engine toward the bottom dead center, the spring member **15** is compressed by the movable press rod member **16**, and the spring guide pin **14** is lowered to touch the inside bottom end of the stepped receiving hole **121**, imparting a pressure to force the crankshaft **B** to rotate, and therefore the piston **A** is moved with the extendable coupling structure **1** rapidly downwardly to the bottom dead center in the combustion engine. When the piston **A** was moved with the extendable coupling structure **1** to the bottom dead center in the combustion engine, the spring member **14** is released. When the spring member **15** returned to its former shape during reciprocating motion of the piston **A**, it imparts a pressure to the second connector **12** against the crankshaft **B**, accelerating the rotation of the crankshaft **B**. Therefore, the spring member **15** is alternatively compressed and released during reciprocating motion of the piston **A**, and the reciprocating speed of the piston **A** is accelerated.

As indicated above, the extendable coupling structure of the present invention uses a spring member to accelerating the rotary motion of the

crankshaft during reciprocating motion of the piston, thereby enhancing the output torque of the engine. Because the invention greatly improves the performance of the engine, the engine can save much fuel and reduces the production of waste gas.

A prototype of extendable coupling structure for use in an engine has been constructed with the features of FIGS. 1~4. The extendable coupling structure for use in an engine functions smoothly to provide all of the features discussed earlier.

Although a particular embodiment of the invention has been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims.